

Remarks**I. Status of the Claims**

In the Office Action, the Examiner indicated that claims 1-23 are pending, 11-19 are rejected and 1-10 and 20-23 are withdrawn from consideration. Applicants affirm the election of Claims 11-19 made during a telephone conversation with the Examiner on December 4, 2006.

II. Objection to the Specification.

On page 5 of the Office Action, paragraph 10, the Examiner objects to the disclosure "because of the following informalities: the phrase 'distributed using distributed on a computer readable media' on Page 20 Line 1 and Page 22 Line 8 should be changed to 'distributed using a computer readable media' or 'distributed on a computer readable media'".

In response, Applicants provide amendments to the specification, providing replacements for paragraphs [0054] and [0059], including changes as suggested by the Examiner. Applicants believe the amendments to paragraphs [0054] and [0059] overcome the objections and respectfully request the Examiner withdraw his objections to paragraphs [0054] and [0059].

III. Rejection of Claims under 35 U.S.C. §101,

In paragraph 12 of the office action, the Examiner rejected claim 19 under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

In response, Applicant amends Claim 19 to clarify that the program product is distributed on a computer readable media. Applicants believe this amendment overcomes the objection to Claim 19 under 35 U.S.C. §101, and respectfully ask that that the rejection be withdrawn.

III. Rejection of Claims 11, 12, and 18 under 35 U.S.C. §103(a),

In paragraph 14 of the Office Action, the Examiner states: "Claims 11, 12, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,415,388 (Browning) in view of U.S. Patent 6,928,559 (Beard).

Paragraphs [0031]-[0035] in the specification (and referenced drawings) describe timing margin distributions and how one can shift the distribution towards more positive slack

(increasing timing margin) by raising voltage where there is a fixed amount of time to traverse a path. A fixed frequency of 2 GHZ example was used, resulting in a 500 picosecond path traversal requirement. In paragraph [0034], “Histogram 15C shows a histogram of path slacks shifted to the right, resulting in all paths having improved timing margin (i.e., additional positive slack). Such a shift can be accomplished by increasing the supply voltage, which can be safely done unless the semiconductor chip is operated in an environment having a temperature towards the top of the environmental temperature range in which the semiconductor chip is expected to operate, and, even then, the chip is likely to be able to operate without exceeding the limit temperature unless the chip is processed such that the FET devices are leaky.”

Browning, in contrast, uses an increase in voltage (when allowable, considering breakdown limits, and temperature of the chip versus temperature limits) to provide for concurrently increasing frequency of the clock, rather than increasing timing margins. Browning does not teach or suggest raising the voltage but NOT also raising the clock frequency. All teachings in Browning include BOTH voltage and frequency changes.

For examples of the tight coupling requirements between voltage and frequency, in Browning’s Claim 1, “... varying the supply voltage and frequency of the clock in response to the determination...”. In Browning’s Claim 6: “... to reduce the supply voltage and the frequency of the clock in response to the monitored power consumption being above the predetermined range of values, and to increase the supply voltage and the frequency of the clock in response...”. Similar limitations of changing BOTH voltage and frequency exist in Browning’s Claim 15 and 18. Similarly, Browning’s specification always tightly couples voltage and frequency; Browning’s drawings always show both voltage and frequency changed together (Fig. 6, references 360 and 370; Fig. 7, references 460 and 470).

Browning, therefore does not teach or suggest increasing timing margin.

Applying Browning to Fig. 2, Browning’s histogram 15B, when supply voltage is raised, would shift right to be, for example, histogram 15C. However, Browning (concurrently changing voltage and frequency) ALSO moves the x-axis slack numbers to the right, making the “zero slack” point coincides with the left edge of histogram 15C. Therefore, no timing margin improvement is taught or suggested in Browning.

To clearly distinguish over Browning, Applicants amend Claim 11 to include a step of not raising frequency of operation of the semiconductor chip when voltage is raised.

It will be noted that Applicants did suggest changing (reducing) frequency ([0052] with reference to Fig. 6, Ref 122; [0041]), but then only in the event of an “uncorrectable thermal fault”, with possible actions in which “System controller 18 would then take predetermined action, such as shutting off regulated unit 20, reducing a frequency of a clock (not shown) input to chip 21, thereby degrading performance of chip 21 but reducing power dissipation, alerting an operator, or taking another predetermined action.” This is an exception, and not part of the method of increasing timing margins. In absence of such an exceptional and uncorrectable thermal fault, Applicants’ chip runs at a fixed frequency as explained above with voltage increases performed for moving path delays towards more positive slack.

Beard, like Browning, similarly teaches always changing frequency and voltage together, and teaches nothing about increasing timing margin by raising supply voltage and not raising frequency.

Applicants submit that there is no teaching or suggestion in Browning or Beard, separately or combined. Therefore, Applicants submit that, with the amendment to Claim 11, Claims 11, 12, and 18 are allowable and respectfully asks that the 35 U.S.C. 103(a) rejections of Claims 11, 12, and 18 be withdrawn.

In paragraph 22 of the Office Action, the Examiner states: “Claims 13-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Browning et al (U. S. patent 6,415,388) in view of Beard (U.S. Patent 6,928,559) as applied to claim 11 above, and in further view of Temperature Sensor and System Monitor in a 10-Pin microMAX by MAXIM.” (hereinafter MAXIM). Applicants agree that the MAXIM chip use programmed threshold data being read to compare to incoming voltage and temperature measurements (Office Action paragraph 24); compares threshold limit values to incoming measured values (Office Action paragraph 25); uses a low limit voltage value and a high limit voltage value used as threshold values (Office action paragraph 27); and discloses a fault signal being activated if the voltage is less than a low limit voltage (Office Action paragraph 28).

Applicants believe that Claim 11, as amended, is allowable, making dependent claims 13-17 also allowable. There is no teaching or suggestion in any of the references, alone or

combined, that teaches increasing timing margin improvements by increasing supply voltage and not increasing frequency.

In paragraph 30 of the Office Action, the Examiner states: "Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Browning et al (U. S. Patent 6,415,388) in view of Beard (U.S. Patent 6,928,559) as applied to claim 11 above, and in further view of Hobson (U. S. Patent 6,112,164)." In paragraph 32 of the Office Action, the Examiner argues that, "Hobson teach the use of a programmable timer to provide a system management interrupt at a specific interval (Column 2 Lines 39-41). One skilled in the art at the time the invention was made would realize that the programmable timer is capable of having its timing interval changed", continuing in paragraph 33, "The advantage of having a programmable timer that is capable of changing time intervals is to manage the different hysteresis characteristics that may exist in different thermal situations (system temperature rising, system temperature falling, etc) with time delay as discussed in Beard (Column 7 Lines 4-12) and referenced above.

Applicants respectfully disagree. Virtually all timers are programmable. This makes them a "commodity" that can be used for many applications, and allow a particular timer to therefore be made available in large quantities and attendant low price. A close examination of Hobson reveals that, once programmed, no further change in the programmable timer's interval is made. See Hobson, Col 3, lines 44-50, "Initialization of timer 104 and the LM75 (i.e., device 106), can be done during computer system 100 BIOS power on self test (POST) processing, or through the ACPI defined SMI ACPI enabling routine at the time when control of computer system 100 is transferred to the ACPI operating system." Hobson has no notion, teaching, or suggestion of "changing the first predetermined time interval to a second predetermined time interval." (Applicants' Claim 18). The Examiner's Beard reference of Column 7 Lines 4-12 offers no hint of changing Beard's hysteresis time-period. A close examination of Beard shows no hint or teaching that Beard's time period is to be changed at all.

The Examiner then alleges that "one of ordinary skill in the art at the time the invention was made to provide the claimed invention of Browning et al as modified by Beard with a programmable timer as taught by Hobson in order to change a first predetermined time interval to a second predetermined time interval in order to manage the different hysteresis characteristics that may exist in different thermal situations with time delay." Applicants respectfully submit

that since all the teaching of programmable timers in the cited references teach only use of the programmable timers as a "set one interval" commodity use; and since no teaching exists to "manage the different hysteresis characteristics that may exist in different thermal situation with time delay" programmed time intervals, including the limitations taught in independent Claim 11 are not obvious to one of ordinary skill in the art. Applicants respectfully submit that the Examiner has impermissibly invented use of multiple time periods for "managing different hysteresis characteristics from different thermal situations". Applicants respectfully disagree that, in view of Beard, Browning, and Hobson, and general knowledge available at the time of the invention, Applicants' Claim 18 is obvious under U.S.C. 103(a). Applicants request that the Examiner reconsider and withdraw the rejection of Claim 18 under U.S.C. 103(a).

Applicants further submit that, as discussed above, that Claim 11, as amended is allowable, and therefore, Claim 18, which depends from Claim 11, is also allowable, notwithstanding the arguments regarding Browning/Beard/Hobson above.

IV. Conclusion

In view of the foregoing comments and amendments, Applicants respectfully request that the application, with claims 11-19 be passed to issue. Applicants' agent invites the Examiner to call at the number below if the Examiner would feel that a phone call would expedite prosecution of this case.

Respectfully submitted,

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